Assessment of the River and Floodplain Restoration Potential in the Transboundary UNESCO Biosphere Reserve "Mura-Drava-Danube"

Austria, Croatia, Hungary, Serbia, Slovenia

Executive Summary

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Executive Summary

Spanning Austria, Croatia, Hungary, Serbia and Slovenia, the lower courses of the Drava and Mura rivers and related sections of the Danube are among Europe's most ecologically important river and floodplain areas, the "Amazon of Europe".

In March 2011, the environment ministers of all five countries agreed to jointly protect and manage the area as a Transboundary UNESCO Biosphere Reserve, under the name "Mura-Drava-Danube" (TBR MDD). The sections within Croatia and Hungary have already been designated by UNESCO in July 2012. The nomination process of the areas in Austria, Serbia and Slovenia is on the way.

Once finally established it will be Europe´s largest protected river area and the world's first pentalateral biosphere reserve (figure ES1).

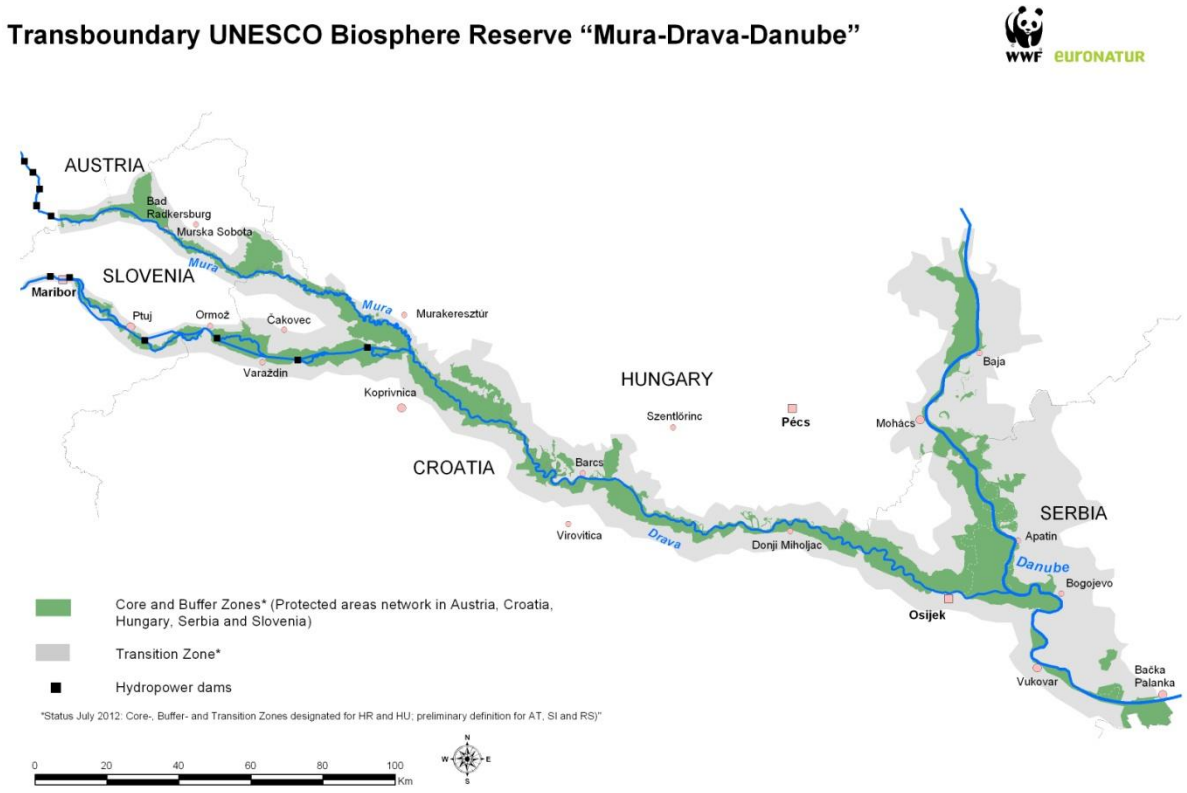

Figure ES 1: Map overview of project area, the TBR MDD.

Despite outstanding natural features and international commitments, the area is struggling with a continuing degradation of habitats and loss of endangered species in the river and floodplain areas. A century of river canalisation, the building of flood dikes, extractions of gravel and sand and the construction of hydropower plants have led to a loss of up to 80 % of the former floodplain areas and the alteration of about 1,100 km of natural river banks and stretches. These changes have direct negative consequences for the long term preservation of the region's characteristic biodiversity and rich ecosystem functions. The situation can improve only if the characteristic natural conditions are restored.

Faced with this challenge, several countries in the TBR MDD have already taken first restoration action in recent years. These efforts should be further supported and widened in scope.

The aim of the study is to provide impetus for necessary restoration efforts and to serve as a base line document for strategic restoration planning in the area. One particular aim is to support the countries in the implementation of EU environmental directives (WFD, FFHD, BD, FD) and the proposals of the ministerial agreement and follow-up for joint zoning and management planning in the Transboundary UNESCO Biosphere Reserve in Austria, Croatia, Hungary, Slovenia and Serbia. It is also intended to provide support for implementation of the “Drava Declaration”, an international agreement on river and floodplain restoration along the Drava. This declaration was signed by the heads of delegations to the ICPDR (International Commission for the Protection of the Danube River) from Slovenia, Austria, Hungary and Croatia as well as the representative of the Republic of Italy.

Methodology

The WWF study is the first comprehensive strategic document for a joint management planning of the Transboundary UNESCO Biosphere Reserve “Mura-Drava-Danube”. Drawing on extensive background data and applying coherent methodology, it analyses the ecological status of river banks and floodplain areas and defines and ranks their potential for restoration.

The restoration proposals are based on the guiding principle that initiation and promotion of hydromorphological dynamics and self

sustaining natural dynamic processes of erosion (in particular lateral erosion), deposition and flooding serve the preservation of the whole spectrum of riverine habitats and species.
The various proposals were sorted into three restoration options:
Option 1: Minimum short-term restoration potential (restoration within the active floodplain focussing on the restoration of river banks and channel by the removal of bank reinforcements/groins and reconnection of side-arms).
Option 2: Maximum restoration potential as long-term restoration target (maximum floodplain extension by dike reallocation and extensive bank/channel restoration).
Option 3: Proposed restoration potential for the medium term including the prioritisation of floodplain areas (very high, high and moderate) outside flood dikes for reconnection with the rivers.

The restoration proposals follow the overall restoration objectives, which are
1) Hydromorphological and water status improvements according to the EU Water Framework Directive (WFD);
2) Ecological improvements according to the EU Habitat and Bird Directives (FFHD and BD) and
3) Flood mitigation according to the EU Floods Directive (FD).

Furthermore, the proposals follow the needs of the TBR MDD, which seek the preservation and restoration of natural conditions in the area.

Results

The assessment covered a total river length of 725 km (145 km of the Mura; 365 km of the Drava and 215 km of the Danube) and an area of 886,400 ha (figure ES 1).

River banks/stretches
The river banks – right and left – are in a natural state over a length of about 189 km (9 %), in a near-natural state over 765 km (38 %) and already altered/impacted over 1,081 km (53 %) (figure ES 2).
There is wide variation between different river sections and countries, however. In stretches such as the Mura along the border between Austria and Slovenia, 95 % of river banks are fixed by embankments (by stones, so-called rip-rap), while on some stretches of the Mura and Drava in Croatia and Hungary, and the Danube

between Croatia and Serbia (Nature Park Kopački Rit), this figure is less than 40 %.
Other river structures, such as open gravel and sand banks, show a similar picture. About 70 % (about 1,700 ha) of this typical riparian habitat type has already been lost over the last 100 years. It still makes up some 731 ha, which are important breeding habitats for endangered birds and sensitive pioneer species.

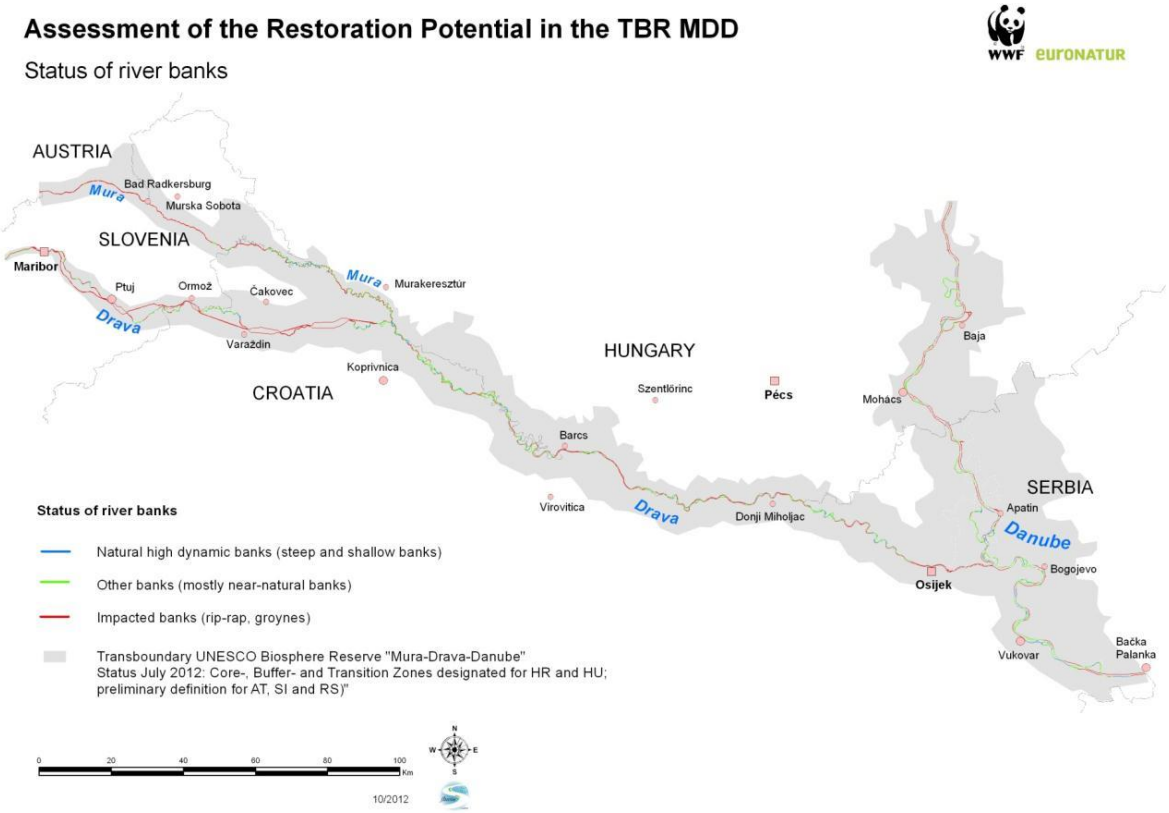

Figure ES 2: Map of status of river banks (summarised status).

The proposed restoration could considerably change the relative proportions of impacted and natural river banks. *From about 1,081 km impacted banks 652 km (60 %) could be restored to highly dynamic banks (from now 189 km to 529 km) and other near-natural banks (from 765 km to 1,077 km)*, while destroyed banks could be reduced to 429 km in total (21 % against 53 % before restoration). 340 km (31 %) of new highly dynamic banks and 312 km (29 %) of near-natural banks would be achieved. This would significantly increase lateral erosion for bed load supply counteracting river bed deepening and create new habitats for endangered species.

Furthermore, a total of *120 major side-channels with a length of 519 km could be reconnected with the rivers* (figure ES 3). Figures ES 4 and 5 show the results for each country, indicating the current situation and the restoration potential.

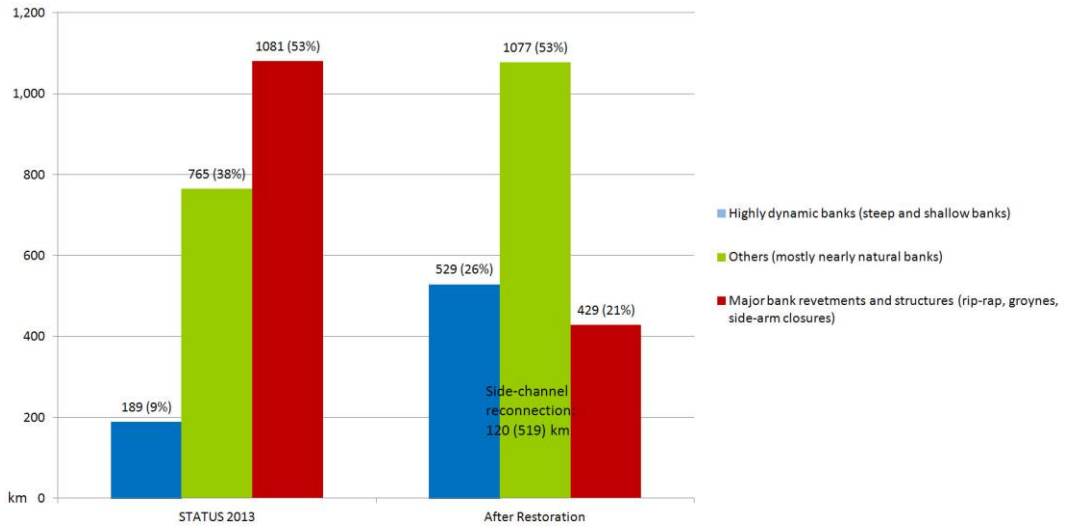

Figure ES 3: Status and restoration potential of river banks (total length, percentage for both river banks in km (not channel length in rkm)). Only main and permanent side channels were analysed for this study.

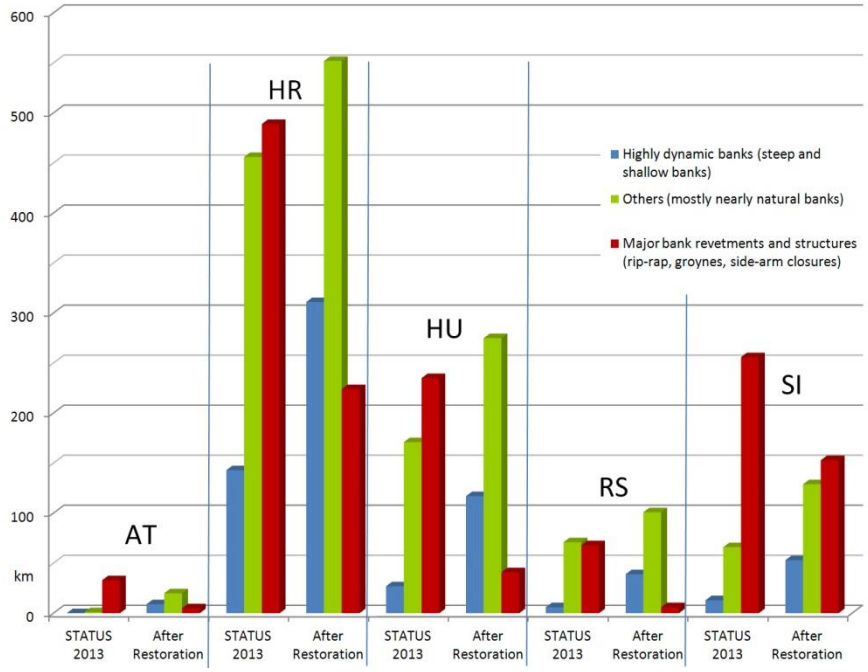

Figure ES 4: Country comparison following figure ES 3.

River banks in km		Austria	Croatia	Hungary	Serbia	Slovenia
Highly dynamic banks (steep and shallow banks)	Status	0	143	27	6	13
	After restoration	**9**	**311**	**117**	**39**	**53**
Others (mostly nearly natural banks)	Status	1	456	171	71	66
	After restoration	**20**	**552**	**275**	**101**	**129**
Major bank revetments and structures (rip-rap, groynes, side-arm closures)	Status	33	489	235	69	256
	After restoration	**5**	**224**	**41**	**6**	**153**

Figure ES 5: Country comparison in table form following figure ES 4

Floodplains

The active floodplain area distributed along all of the river stretches totals 132,341 ha, which is 22 % of its former extent, the "morphological floodplain". About 465,136 ha or 78 % has been lost through the construction of flood dikes (compare figures ES 6 and ES 7).

In different countries, the loss of active floodplains varies from 66 % to 90 % (figure ES 8). About 91,040 ha of the morphological floodplain outside the flood dikes consist of typical floodplain remnants (oxbows, forest and grasslands called as the "former floodplain").

From 465,136 ha of floodplains outside the dikes 165,318 ha (36 %) could be reconnected which would be raising the size of active floodplain from 132,341 ha to 297,659 ha, reducing the overall loss to about 50 % (figure ES 7; country comparison in figure ES 8 and 9, see next pages).

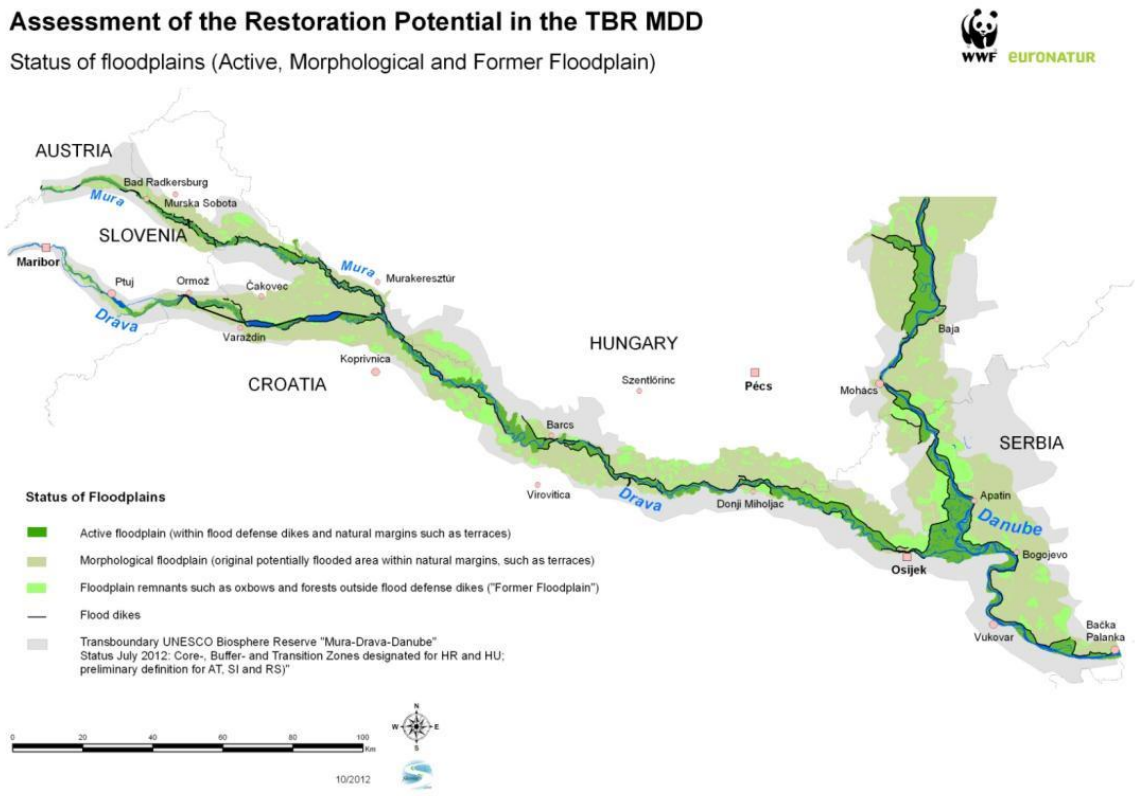

Figure ES 6: Map of floodplain status.

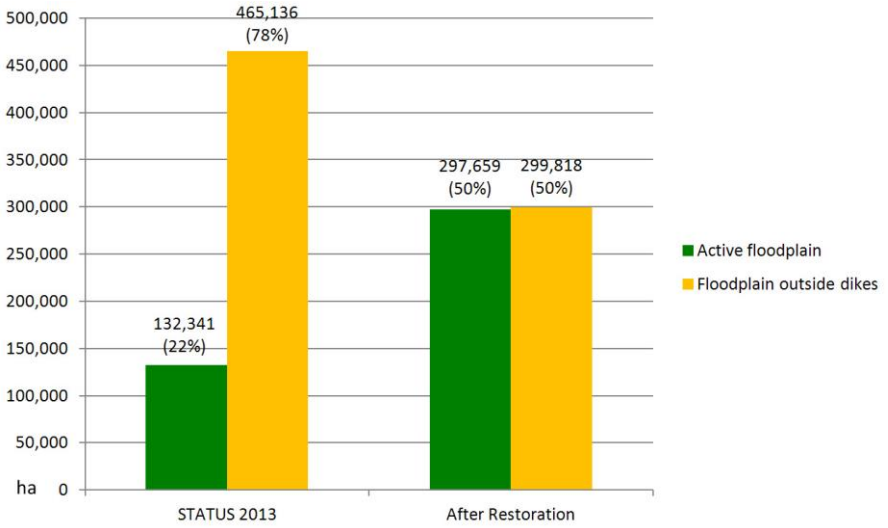

Figure ES 7: Status and restoration potential of floodplains.

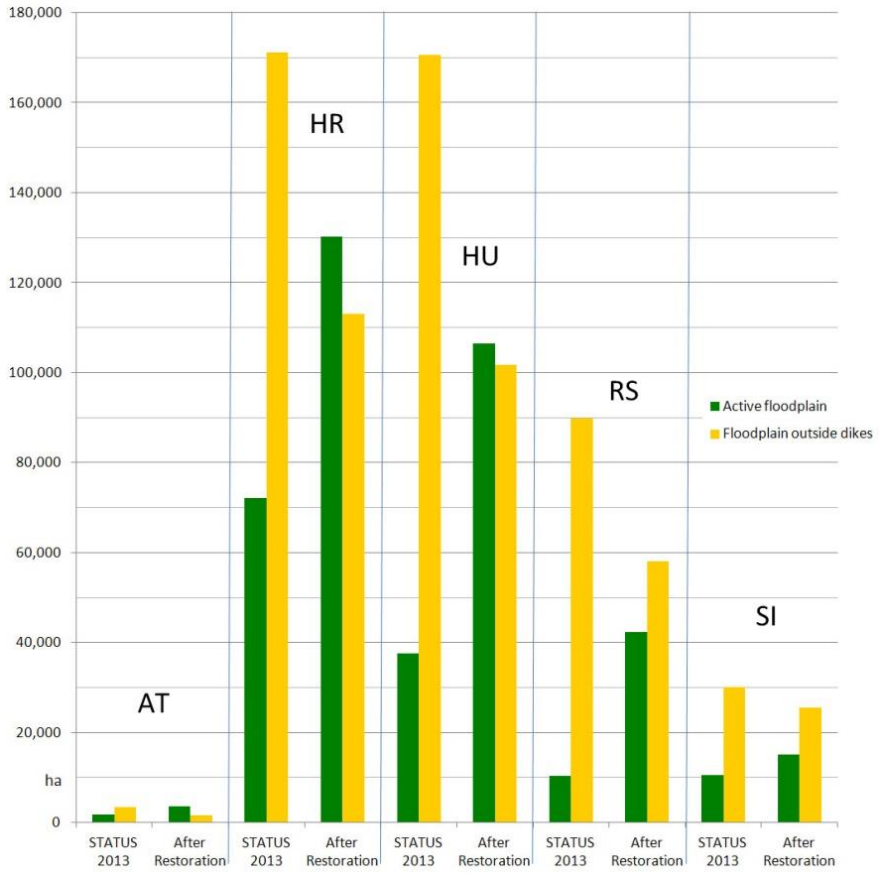

Figure ES 8: Country comparison following figure ES 6.

Floodplain in ha		Austria	Croatia	Hungary	Serbia	Slovenia
Active floodplain	Status	1,757	72,143	37,562	10,357	10,522
	After restoration	**3,610**	**130,223**	**106,430**	**42,284**	**15,112**
Floodplain outside dikes	Status	3,361	171,139	170,667	89,880	30,089
	After restoration	**1,508**	**113,059**	**101,799**	**57,953**	**25,499**

Figure ES 9: Country comparison in table form following figure ES 7

Prioritisation of floodplain reconnection

Altogether *74 potential priority restoration areas* have been identified along the three rivers (Figures ES 10 and ES 11, list of areas in the map). It makes up *254,093 ha*, and includes land on both active and morphological floodplains outside flood dikes.

Figure ES 10 shows the detailed distribution of prioritisation classes (based on landuse/habitats, nature protection, flood retention potential and hydromorphological situation). The calculation is based on only 72 areas, since two areas contain no floodplain extension (floodplain of Gemenc in Hungary and south of Drava confluence into Danube in Croatia). Their overall size is 165,318 ha. *The first category, "very high potential", is represented by nine areas (26,392 ha), the second category, "high potential" by 53 areas (130,689 ha) and the third, "moderate" category by ten areas (8,237 ha).*

In areas of highest priority, an average of about 10 km of dikes must be removed or relocated.

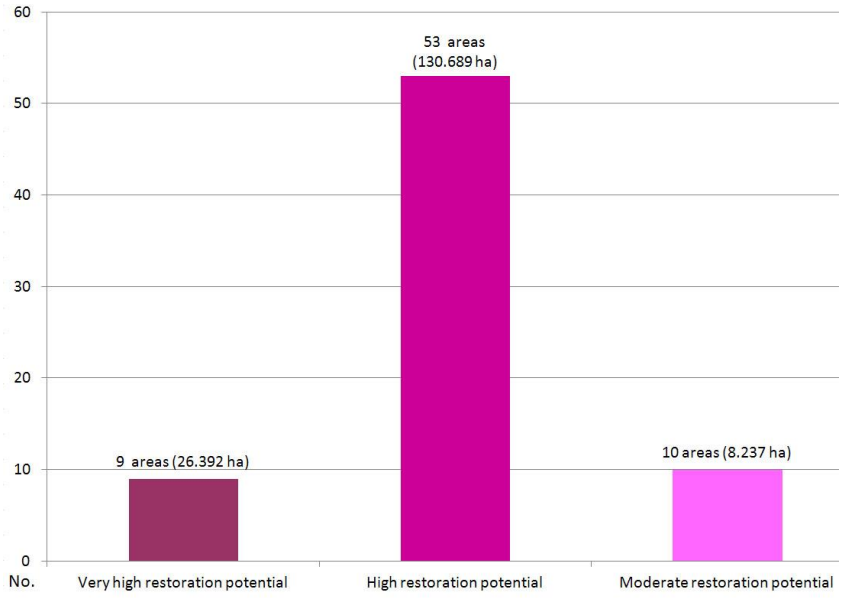

Figure ES 10: Prioritisation of floodplain areas for reconnection (compare fig. ES 11).

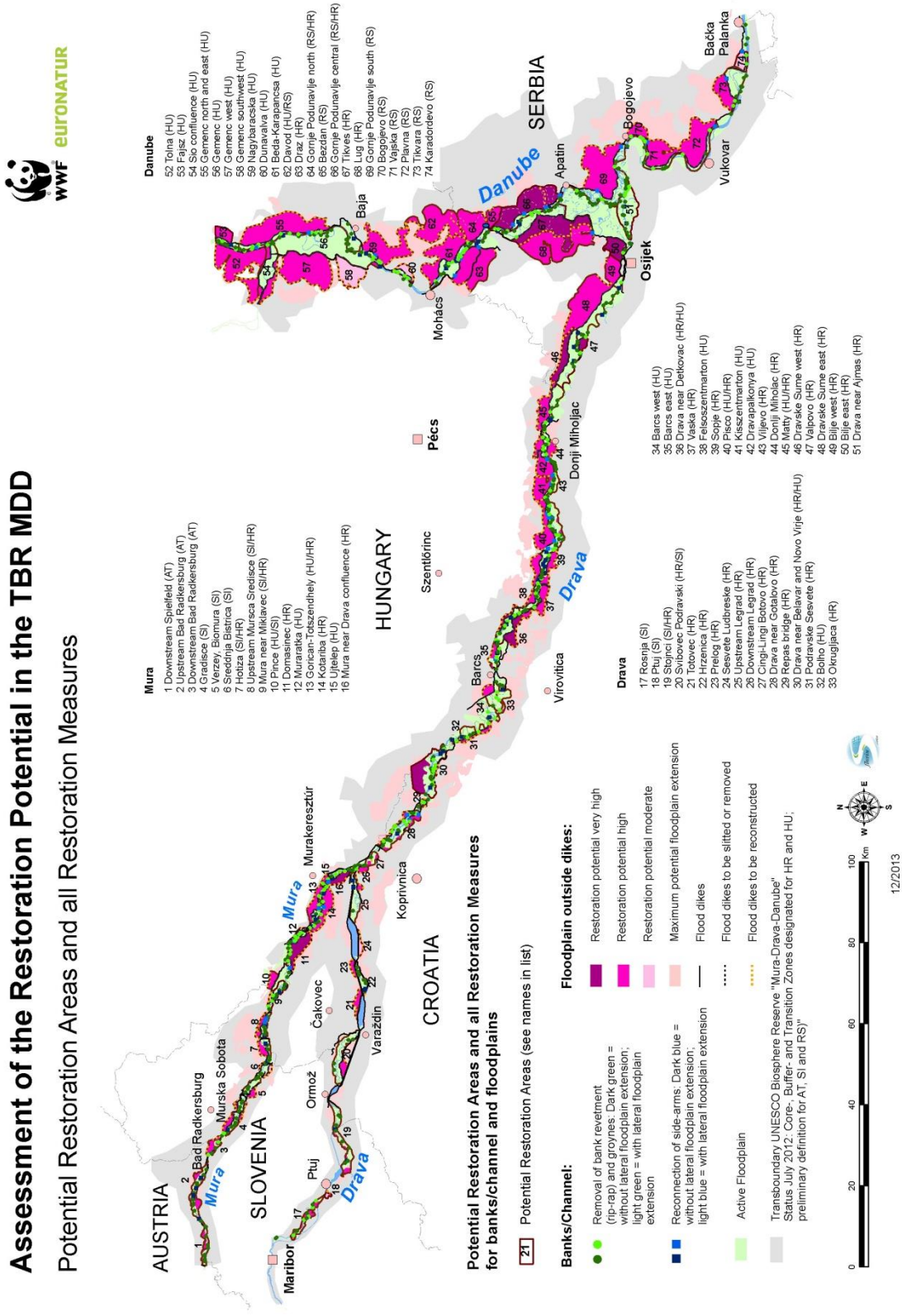

Figure ES 11: Joint map of potential restoration areas and measures.

Natural values at stake

The rich biodiversity of the TBR MDD is based on its extensive free-flowing river stretches and adjacent floodplain and wetland areas, and is reflected in a wide range of characteristic and endangered habitats and species. The area is notable for having the largest and best preserved softwood forests and floodplain areas in the Danube Basin (Kopački rit area) and highly dynamic and meandering river stretches with typical habitats such as gravel and sand banks, steep banks, river islands, side arms and oxbows (e.g. Lower Drava, Drava downstream Drava-Mura confluence, Border Mura between HR and SI). These qualities are the basis for largest breeding population of the white-tailed eagle in Continental Europe. The area is home for nearly the whole range of typical "river birds" such as little and common terns, little-ringed plover, sand piper, sand martin, kingfisher and bee-eater as well as nearly-extinct fish species such as the ship sturgeon. These species are excellent indicators for the state of the river landscape. Their habitats, however, are at risk. For example, nearly 80 % of the sand martin population along the Drava has been lost in the last 10 years, mainly due to the still-ongoing replacement of natural steep banks by new embankments. The restoration of natural conditions would be a big win for the TBR MDD. In addition to conserving biodiversity, it would bring multiple benefits for flood protection, water purification (and thus healthy drinking water), fish grounds, favourable groundwater conditions for forests and agriculture and recreation for local people.

Costs of restoration

A very preliminary cost estimate is based on reference projects in Austria and Germany and the assumption that prices (of planning, land purchase/compensation and restoration measures) are in general lower in the respective countries. The total cost would be €1.1 billion, which comprises removal of 652 km of embankments (€260 million), 120 side-channels for reconnection (€12 million only for works without dredging or land purchase) and reconnection of 164,900 ha of floodplain, including the relocation of flood dikes (€825 million). This would be shared by five countries (to be adjusted by prices and conditions over the coming decades).

Conclusions

Compared to other rivers in Europe, the stretches of the Mura, Drava and Danube rivers within the Transboundary Biosphere Reserve have retained more of their natural assets than many other Western and Central European rivers. However, there has been a considerable loss of natural river stretches and floodplains in the last 100 years (up to 1,100 km of natural river banks (total length) with associated gravel and sand bars and 80 % of the former floodplain areas). Comprehensive restoration efforts are essential in the upcoming decades to counteract and reverse these negative trends.

The study shows that there is substantial restoration potential in this area. It outlines a way forward for comprehensive restoration, starting with the removal of river bank reinforcements and reconnection of side-channels and culminating with the large-scale reconnection of floodplain areas with the rivers.

Restoration projects, implemented in sufficient numbers, could significantly reduce the further degradation of the river bed and floodplain areas along the entire river reaches. This would safeguard the long-term survival of the characteristic habitats and species, and of the ecosystem benefits the river system provides.

Restoration is definitely one of the major tasks of the Transboundary Biosphere Reserve “Mura-Drava-Danube” and will support the countries in achieving EU evironmental objectives (WFD, FFHD, BD, FD) as well as the objectives agreed in the international “Drava Declaration” in Maribor in September 2008.

In order to achieve the appropriate implementation a transboundary river restoration programme should be developed across the five countries. EU funding e.g. LIFE, Structural Funds etc. should be used to develop and implement concrete restoration projects. There are already first restoration projects in the TBR area implemented and ongoing as well as good practice examples across Europe (e.g. Danube, Upper Drava and Mura, Loire/Allier, Elbe, Rhine) which demonstrate the multiple benefits of restoration for nature and people.

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This work is dedicated to Martin Schneider-Jacoby who spent virtually half of it's lifetime for nature protection in the Balkans and along Sava and Drava.

Cover photo: Danube River near the Drava mouth (Kopački Rit), Martin Schneider-Jacoby